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FIG.1

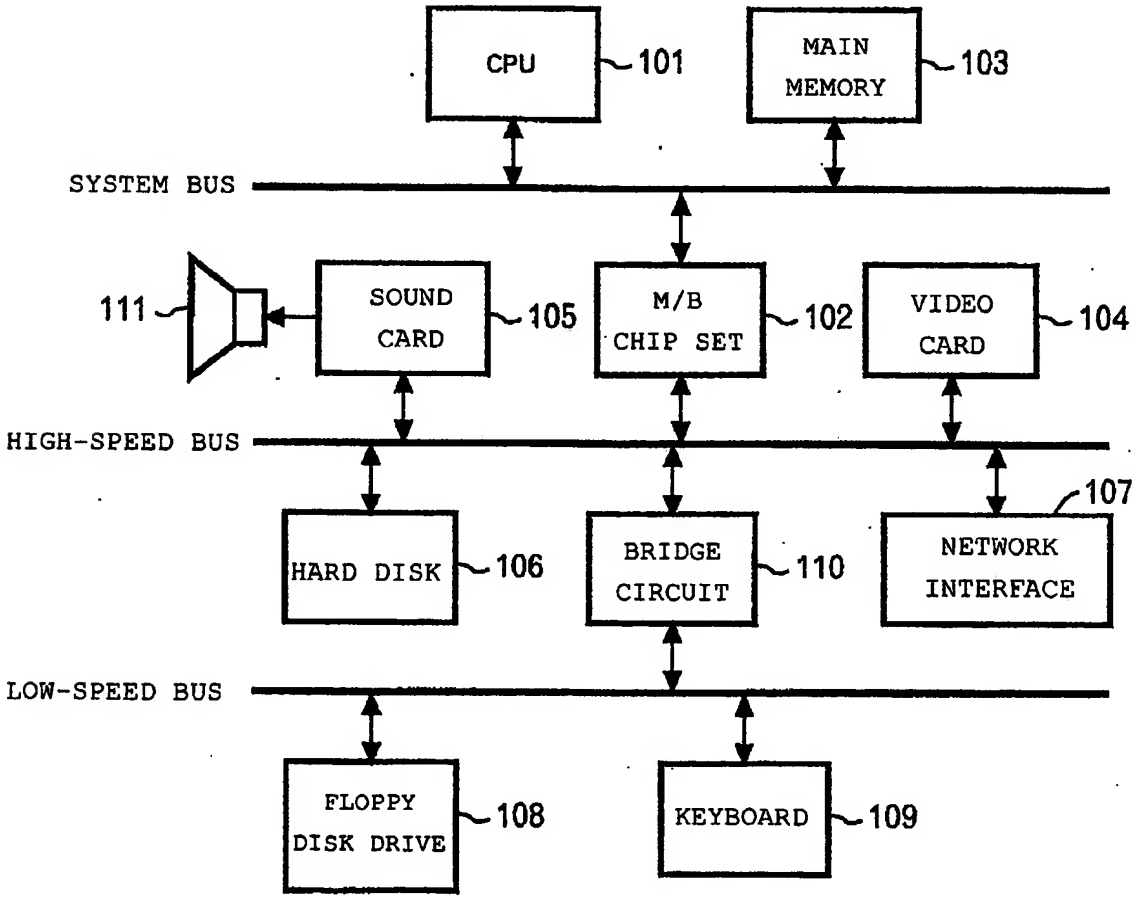

CPU
101
MAIN MEMORY
103
SYSTEM BUS
111
SOUND CARD
105
M/B CHIP SET
102
VIDEO CARD
104
HIGH-SPEED BUS
107
HARD DISK
106
BRIDGE CIRCUIT
110
NETWORK INTERFACE
LOW-SPEED BUS
FLOPPY DISK DRIVE
108
KEYBOARD
109

FIG.2

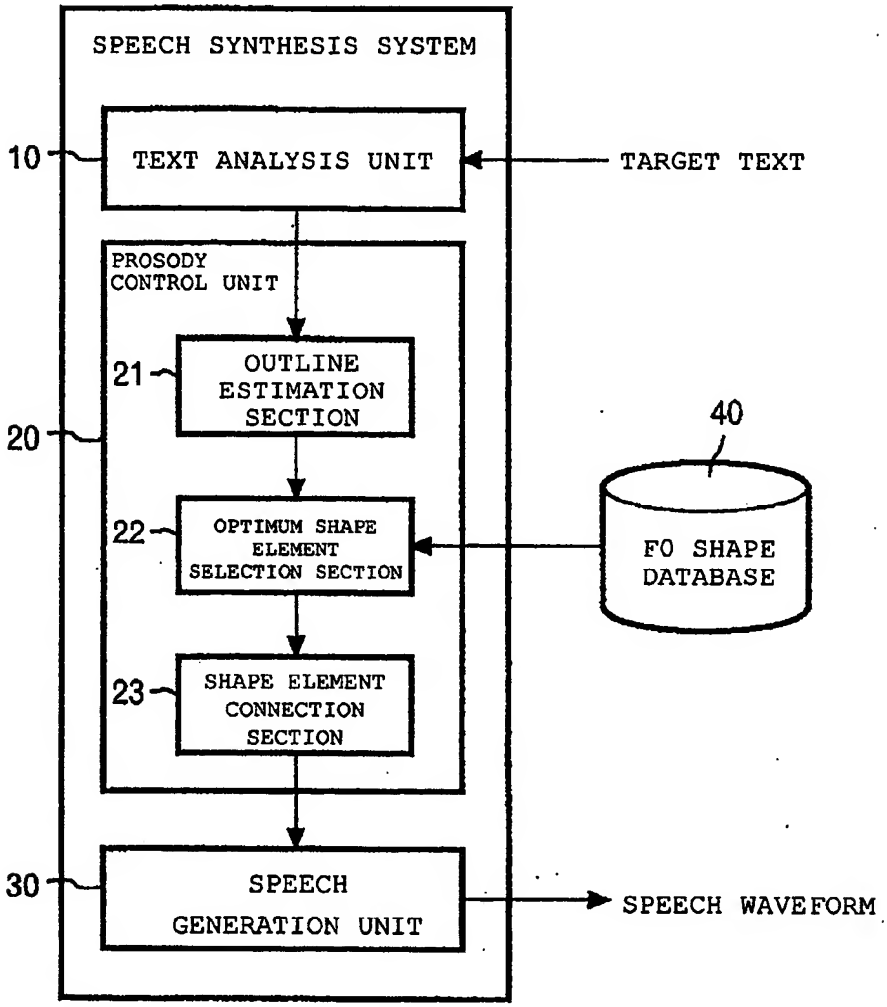

SPEECH SYNTHESIS SYSTEM
10
TEXT ANALYSIS UNIT
TARGET TEXT
PROSODY CONTROL UNIT
20
21
OUTLINE ESTIMATION SECTION
22
OPTIMUM SHAPE ELEMENT SELECTION SECTION
23
SHAPE ELEMENT CONNECTION SECTION
40
F0 SHAPE DATABASE
30
SPEECH GENERATION UNIT
SPEECH WAVEFORM

FIG.3

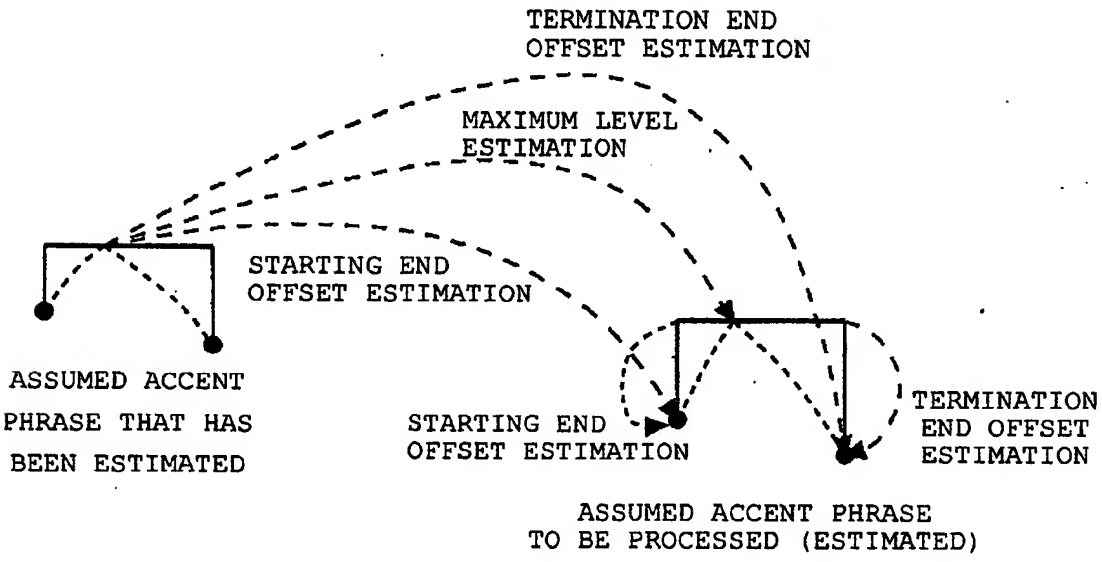

TERMINATION END
OFFSET ESTIMATION
MAXIMUM LEVEL
ESTIMATION
STARTING END
OFFSET ESTIMATION
ASSUMED ACCENT
PHRASE THAT HAS
BEEN ESTIMATED
STARTING END
OFFSET ESTIMATION
TERMINATION
END OFFSET
ESTIMATION
ASSUMED ACCENT PHRASE
TO BE PROCESSED (ESTIMATED)

FIG.4

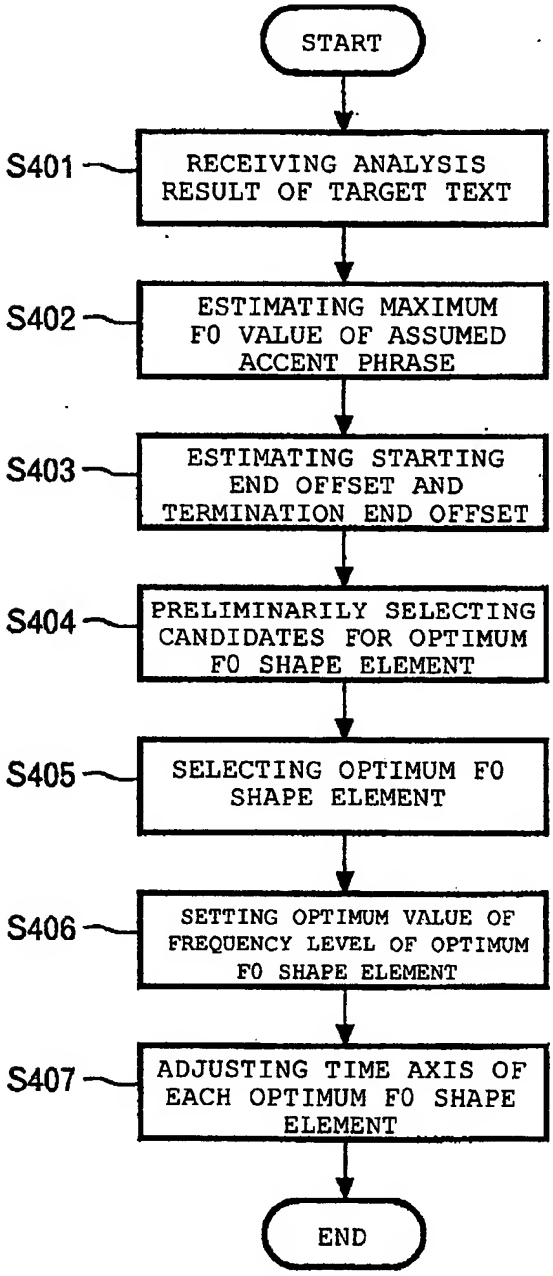
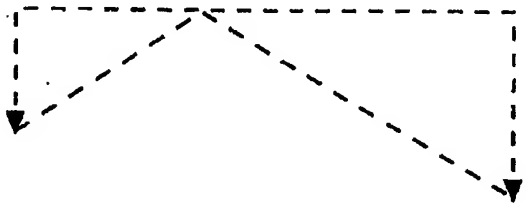
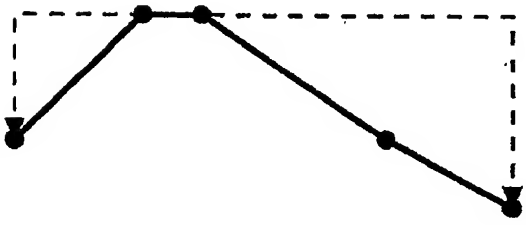

START
S401
RECEIVING ANALYSIS RESULT OF TARGET TEXT
S402
ESTIMATING MAXIMUM F0 VALUE OF ASSUMED ACCENT PHRASE
S403
ESTIMATING STARTING END OFFSET AND TERMINATION END OFFSET
S404
PRELIMINARILY SELECTING CANDIDATES FOR OPTIMUM F0 SHAPE ELEMENT
S405
SELECTING OPTIMUM F0 SHAPE ELEMENT
S406
SETTING OPTIMUM VALUE OF FREQUENCY LEVEL OF OPTIMUM F0 SHAPE ELEMENT
S407
ADJUSTING TIME AXIS OF EACH OPTIMUM F0 SHAPE ELEMENT
END

FIG.5



F0 SHAPE TARGET

FIG.6



OPTIMUM F0 SHAPE ELEMENT

FIG.7

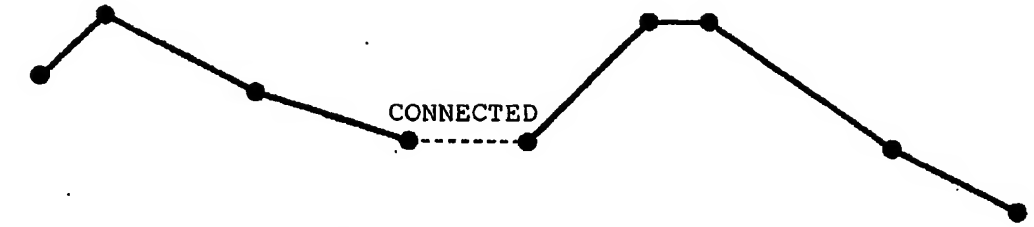

CONNECTED
OPTIMUM F0 SHAPE ELEMENT IMMEDIATELY BEFORE
OPTIMUM F0 SHAPE ELEMENT

FIG.8

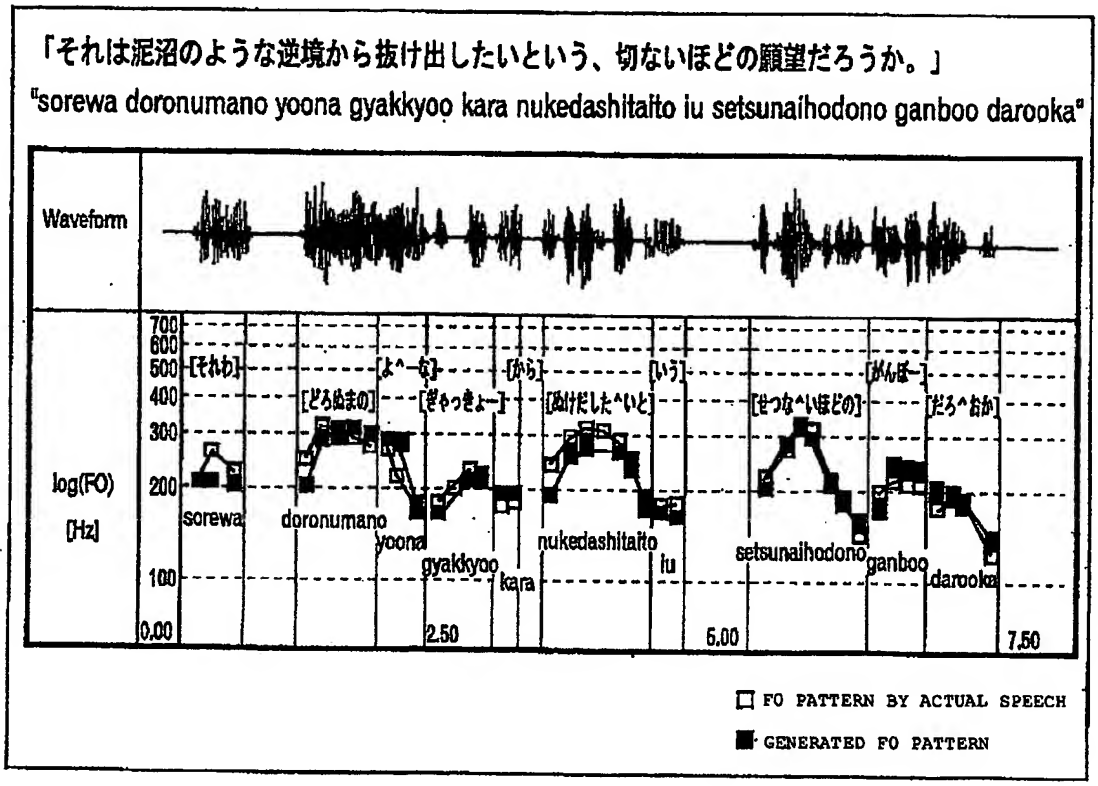

「それは泥沼のような逆境から抜け出したいという、切ないほどの願望だろうか。」
"sorewa doronumano yoona gyakkyoo kara nukedashitaito iu setsunaihodono ganboo darooka"
Waveform
log(F0) [Hz]
700
600
500
400
300
200
100
0.00
2.50
5.00
7.50
[それわ]
[どろぬまの]
[よ^ーな]
[ぎゃっきょー]
[から]
[ぬけだした^いと]
[いう]
[せつな^いほどの]
[がんぼー]
[だろ^おか]
sorewa
doronumano
yoona
gyakkyoo
kara
nukedashitaito
iu
setsunaihodono
ganboo
darooka
F0 PATTERN BY ACTUAL SPEECH
GENERATED F0 PATTERN

FIG.9

```
Tmp#: 33/280 (nCand=3) Type:ACC=0/Mora=3 SOREWA
    [In  ] ( -1/ -1) 1 <  0/  3> 1 (  0/  5)
      ENVIRONMENTAL ATTRIBUTE OF INPUTTED PHRASE (PRECEDENT ACCENT PHRASE
    =>TYPE/LENGTH, EXISTENCE OF PAUSE, CONCERNED ACCENT PHRASE TYPE/LENGTH,
      EXISTENCE OF PAUSE, SUBSEQUENT ACCENT PHRASE TYPE/LENGTH)
    [* 33] (  2/  5) 1 <  0/  3> 1 (  1/  5)  pd=0  449  korega
      =>ATTRIBUTE INFORMATION OF OBTAINED SHAPE ELEMENT
Tmp#: 100/330 (nCand=3) Type:ACC=0/Mora=5 DORONUMANO
    [In  ] (  0/  3) 1 <  0/  5> 0 (  1/  3)
    [*100] (  0/  4) 0 <  0/  5> 1 (  3/  4)  pd=0  942  yorokobimo
Tmp#: 277/353 (nCand=44) Type:ACC=1/Mora=3 YO:NA
    [In  ] (  0/  5) 0 <  1/  3> 0 (  0/  4)
    [*277] (  0/  4) 0 <  1/  3> 1 (  2/  6)  pd=0 2711  ma^kki
Tmp#: 128/431 (nCand=3) Type:ACC=0/Mora=4 GYA_QKYO:
    [In  ] (  1/  3) 0 <  0/  4> 0 (  0/  2)
    [*128] (  0/  2) 0 <  0/  4> 0 (  2/  3)  pd=0 1028  shukkin
Tmp#:  3/155 (nCand=49) Type:ACC=0/Mora=2 KARA
    [In  ] (  0/  4) 0 <  0/  2> 1 (  5/  7)
    [*  3] (  1/  4) 0 <  0/  2> 1 (  1/  4)  pd=0  103  yobi
Tmp#:  1/23 (nCand=1) Type:ACC=5/Mora=7 NUKEDASHITAITO
    [In  ] (  0/  2) 1 <  5/  7> 0 (  0/  2)
    [*  1] (  1/  3) 1 <  5/  7> 1 ( -1/ -1)  pd=2  5  nejimageta^noda
Tmp#: 30/155 (nCand=11) Type:ACC=0/Mora=2 IU
    [In  ] (  5/  7) 0 <  0/  2> 1 (  3/  7)
    [* 30] (  1/  4) 0 <  0/  2> 0 (  0/  5)  pd=0  696  iu
Tmp#: 7/37  (nCand=1) Type:ACC=3/Mora=7 SETSUNAIHODONO
    [In  ] (  0/  2) 1 <  3/  7> 0 (  0/  4)
    [*  7] ( -1/ -1) 1 <  3/  7> 0 (  0/  5)  pd=3  1080  juppu^nkanno
Tmp#: 83/431 (nCand=13) Type:ACC=0/Mora=4 GA_NBO:
    [In  ] (  3/  7) 0 <  0/  4> 0 (  2/  4)
    [* 83] ( -1/ -1) 1 <  0/  4> 0 (  1/  5)  pd=0  700  hanbai
Tmp#: 105/127 (nCand=1) Type:ACC=2/Mora=4 DAROOKA
    [In  ] (  0/  4) 0 <  2/  4> 1 ( -1/ -1)
    [*105] (  0/  4) 0 <  2/  4> 0 (  0/  2)  pd=4  2615  mie^ruto
```

FIG.10

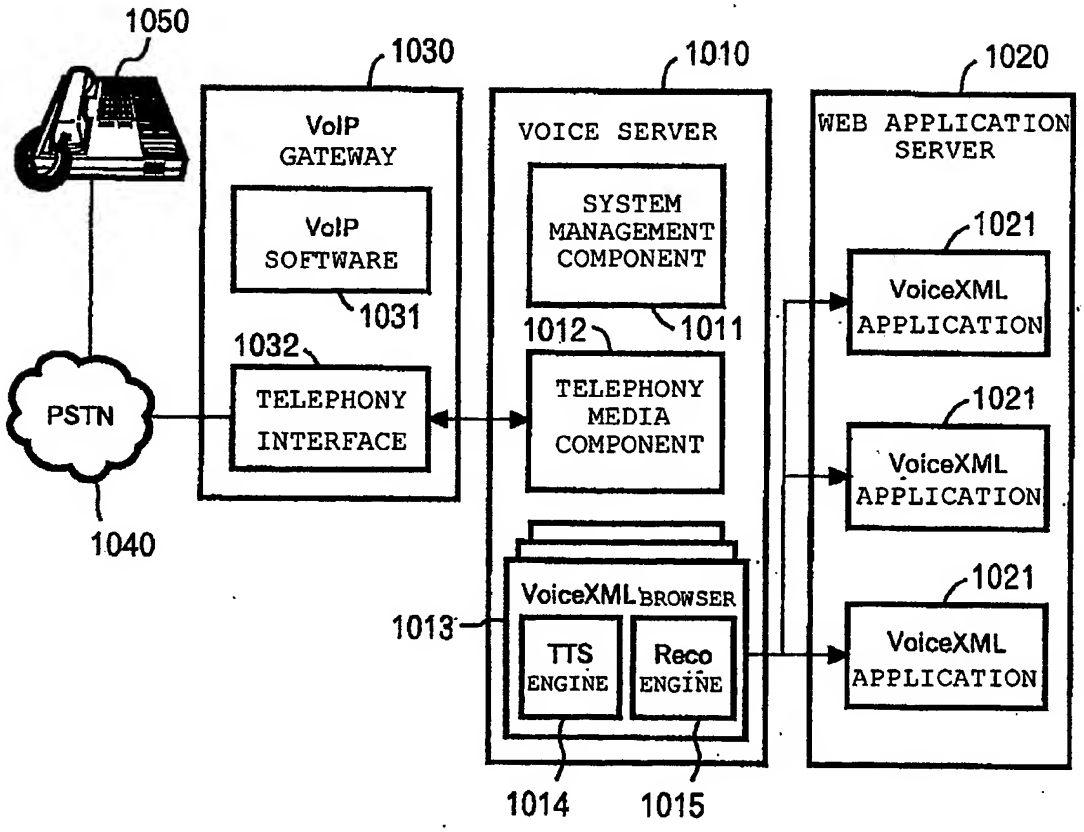

1050
1030
1010
1020
VoIP GATEWAY
VoIP SOFTWARE
1031
1032
TELEPHONY INTERFACE
PSTN
1040
VOICE SERVER
SYSTEM MANAGEMENT COMPONENT
1012
1011
TELEPHONY MEDIA COMPONENT
VoiceXML BROWSER
1013
TTS ENGINE
Reco ENGINE
1014
1015
WEB APPLICATION SERVER
1021
VoiceXML APPLICATION
1021
VoiceXML APPLICATION
1021
VoiceXML APPLICATION

FIG.11

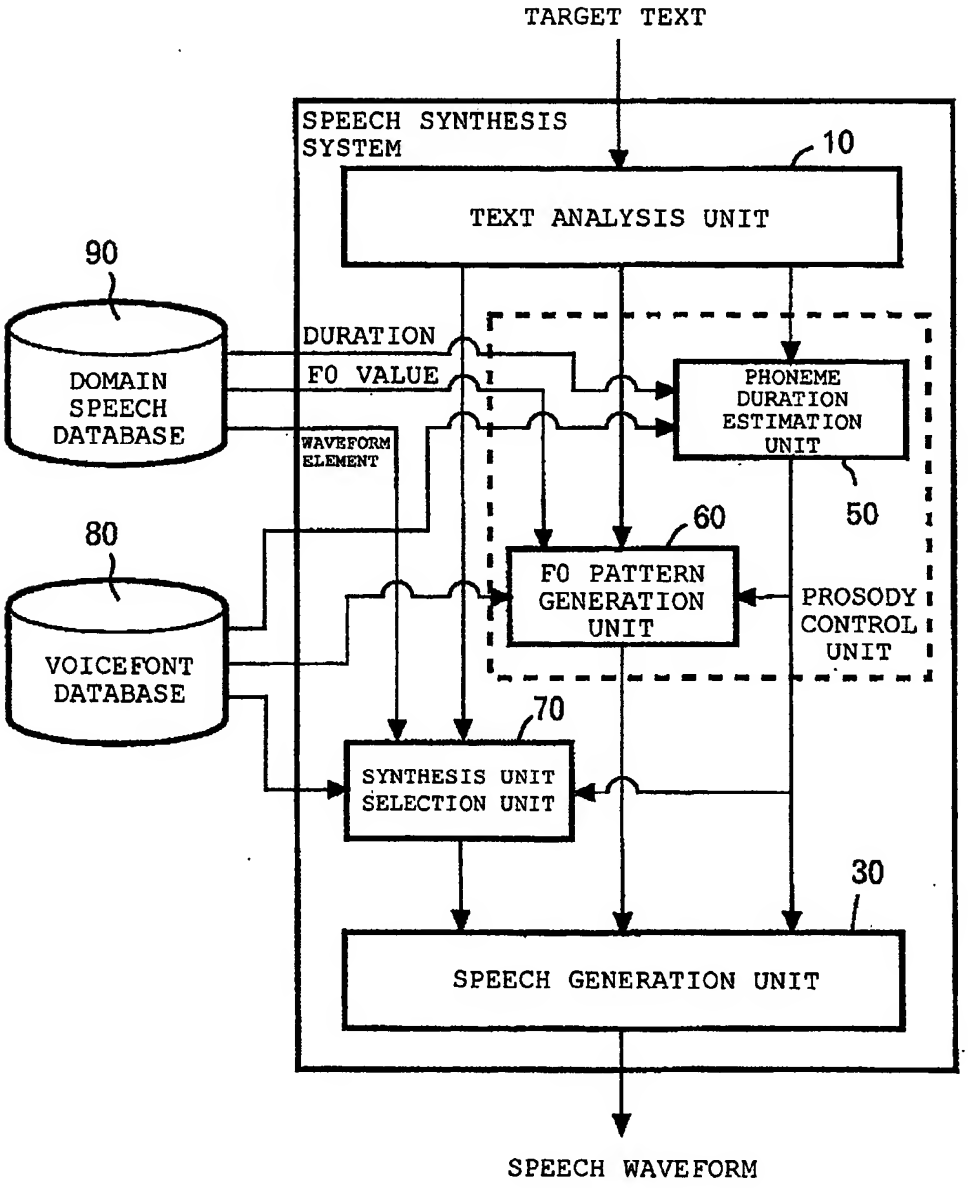

TARGET TEXT
SPEECH SYNTHESIS SYSTEM
10
TEXT ANALYSIS UNIT
90
DOMAIN SPEECH DATABASE
DURATION
F0 VALUE
WAVEFORM ELEMENT
PHONEME DURATION ESTIMATION UNIT
50
80
VOICEFONT DATABASE
60
F0 PATTERN GENERATION UNIT
PROSODY CONTROL UNIT
70
SYNTHESIS UNIT SELECTION UNIT
30
SPEECH GENERATION UNIT
SPEECH WAVEFORM

FIG.12

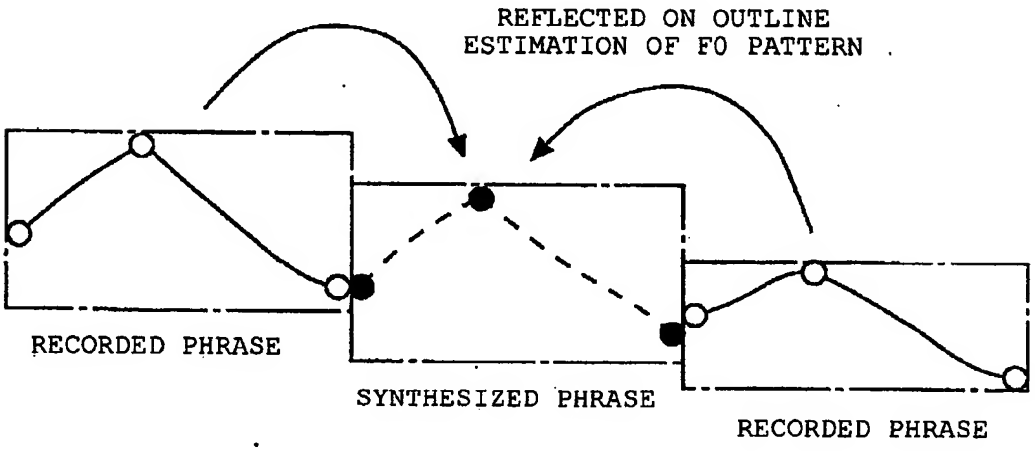

REFLECTED ON OUTLINE
ESTIMATION OF F0 PATTERN
RECORDED PHRASE
SYNTHESIZED PHRASE
RECORDED PHRASE

FIG.13

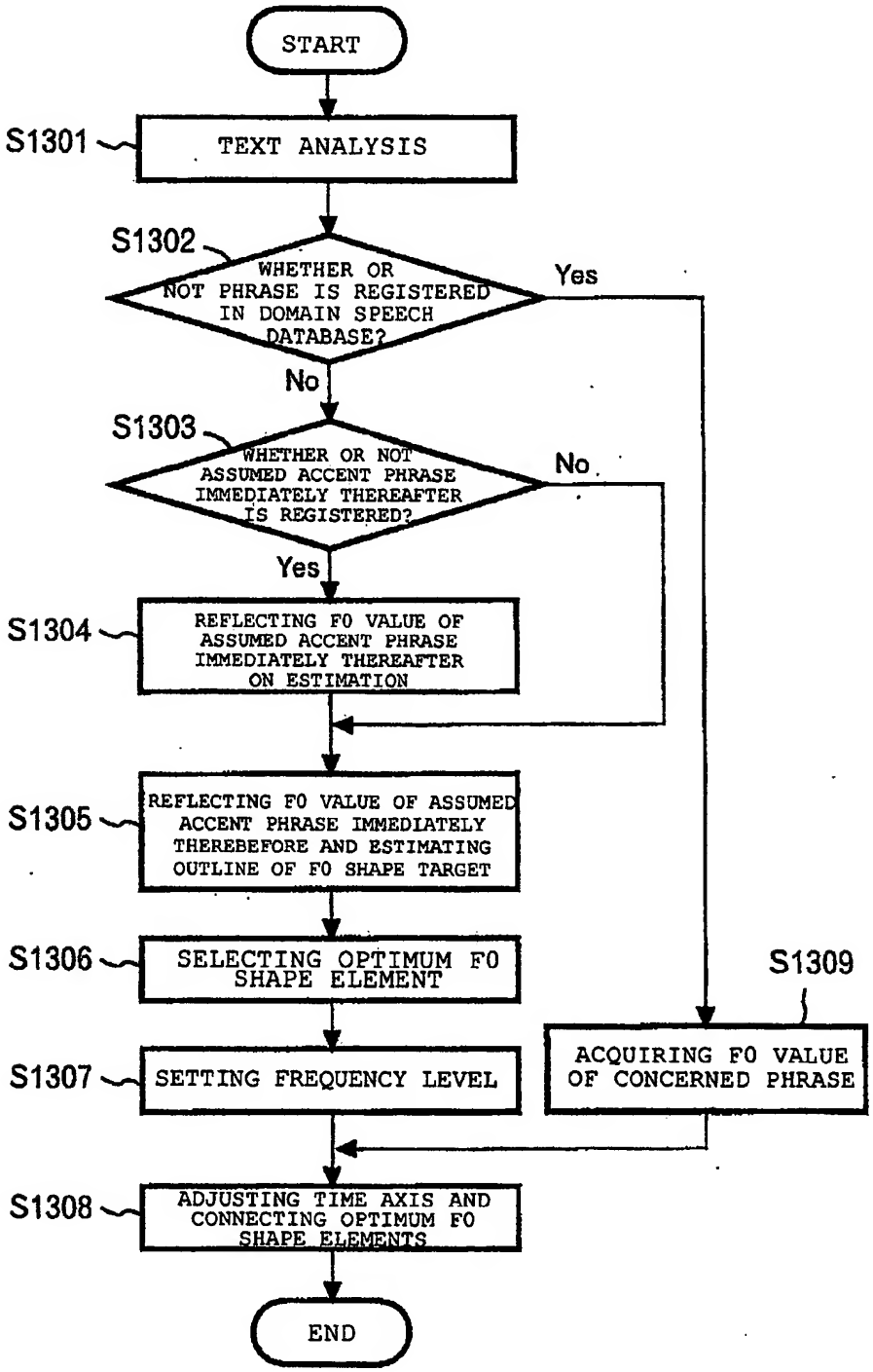
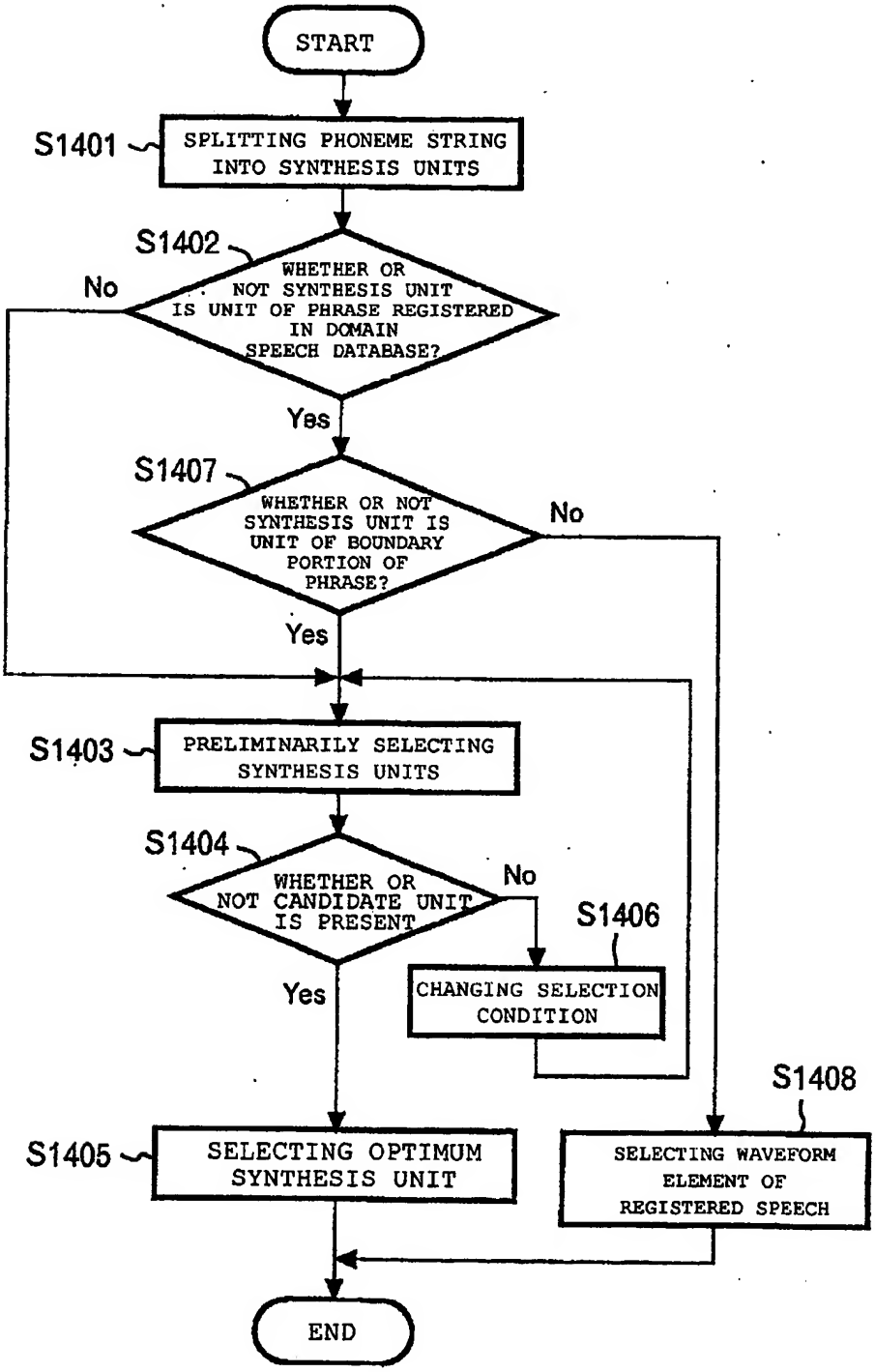

START
S1301
TEXT ANALYSIS
S1302
WHETHER OR NOT PHRASE IS REGISTERED IN DOMAIN SPEECH DATABASE?
Yes
No
S1303
WHETHER OR NOT ASSUMED ACCENT PHRASE IMMEDIATELY THEREAFTER IS REGISTERED?
No
Yes
S1304
REFLECTING F0 VALUE OF ASSUMED ACCENT PHRASE IMMEDIATELY THEREAFTER ON ESTIMATION
S1305
REFLECTING F0 VALUE OF ASSUMED ACCENT PHRASE IMMEDIATELY THEREBEFORE AND ESTIMATING OUTLINE OF F0 SHAPE TARGET
S1306
SELECTING OPTIMUM F0 SHAPE ELEMENT
S1307
SETTING FREQUENCY LEVEL
S1309
ACQUIRING F0 VALUE OF CONCERNED PHRASE
S1308
ADJUSTING TIME AXIS AND CONNECTING OPTIMUM F0 SHAPE ELEMENTS
END

FIG.14


START
S1401
SPLITTING PHONEME STRING INTO SYNTHESIS UNITS
S1402
WHETHER OR NOT SYNTHESIS UNIT IS UNIT OF PHRASE REGISTERED IN DOMAIN SPEECH DATABASE?
No
Yes
S1407
WHETHER OR NOT SYNTHESIS UNIT IS UNIT OF BOUNDARY PORTION OF PHRASE?
No
Yes
S1403
PRELIMINARILY SELECTING SYNTHESIS UNITS
S1404
WHETHER OR NOT CANDIDATE UNIT IS PRESENT
No
S1406
CHANGING SELECTION CONDITION
Yes
S1405
SELECTING OPTIMUM SYNTHESIS UNIT
S1408
SELECTING WAVEFORM ELEMENT OF REGISTERED SPEECH
END